

### Problem 1

Classify each function as a power function, root function, polynomial (state its degree), rational function, algebraic function, trigonometric function, exponential function, or logarithmic function.

1.  $f(x) = \log_2 x$

log

2.  $g(x) = \sqrt[4]{x}$

root

3.  $h(x) = \frac{2x^3}{1-x^2}$

rational

4.  $u(t) = 1 - 1.1t + 2.54t^2$

polynomial deg. 2

5.  $v(t) = 5^t$

exponential

6.  $w(\theta) = \sin \theta \cos^2 \theta$

trigonometric

### Problem 2

Find the domain of the function.

1.  $f(x) = \frac{\cos(x)}{1-\sin(x)}$

$1 \neq \sin x$ ,  $x \neq \frac{\pi}{2} + 2\pi n$ ,  $n = \text{any integer}$

2.  $g(x) = \frac{1}{1-\tan(x)}$

$1 \neq \tan x$ ,  $x \neq \frac{\pi}{4} + \pi n$ ,  $n = \text{any integer}$

### Problem 3

Many physical quantities are connected by *inverse square laws*, that is, by power functions of the form  $f(x) = kx^{-2}$ . In particular, the illumination of an object by a light source is inversely proportional to the square of the distance from the source. Suppose that after dark you are in a room with just one lamp and you are trying to read a book. The light is too dim and so you move halfway to the lamp. How much brighter is the light?

Try two values of  $x$ ,  $f(1) = k$ ,  $f(2) = \frac{k}{4}$

→ 4 times as bright.

In general  $\frac{4k}{x^2} = \frac{k}{(x/2)^2}$

## Problem 4

1. Find an equation for a family of linear functions with slope 2 and sketch several members of the family.
2. Find an equation for the family of linear functions such that  $f(2) = 1$  and sketch several members of the family.
3. Which function belongs to both families?

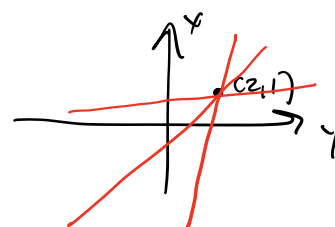
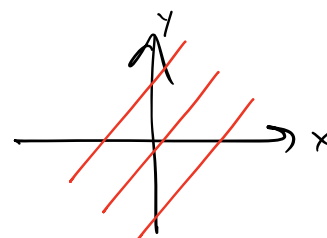
## Problem 5

Find an expression for a cubic function  $f$  if  $f(1) = 6$  and  $f(-1) = f(0) = f(2) = 0$ .

4.1)  $y = 2x + c$ ,  $c$  any number

4.2)  $y = m(x - 2) + 1$ ,  $m$  any number

4.3)  $y = 2x - 3$



5)  $f(-1) = f(0) = f(2) = 0$ , so we must have

$$f(x) = C(x+1)(x)(x-2), \text{ for some } C$$

$$\text{Also } 6 = f(1) = C(1+1)(1)(1-2)$$

$$\Rightarrow C = -3$$

$$\Rightarrow f(x) = -3x(x+1)(x-2)$$